APPENDIX E

PARAMETRIC EMISSIONS MONITORING SYSTEMS FOR HEATERS AND BOILERS WITH CAPACITIES BETWEEN 150 AND 100 mmBTU/HR

MAP shall continuously monitor NOx and CO emissions from heaters and boilers with capacities of less than 150 mmBTU/hr (HHV) but greater than 100 mmBTU/hr (HHV) in accordance with this Appendix to demonstrate compliance with the NOx requirements established for Controlled Heaters and Boilers pursuant to Paragraph 13., to establish the Baseline for any PAL for NOx and CO, and to demonstrate compliance with the CAP. MAP shall continuously monitor by either (1) installing and operating a NOx or CO CEMS or (2) installing a Parametric Emission Monitoring System (PEMS) for NOx or CO. A CEMS directly measures the gas concentration of NOx or CO in a stack. A PEMS is a mathematical model that predicts the gas concentration of NOx or CO in the stack based on a set of operating data. Consistent with the CEMS data frequency requirements of 40 CFR Part 60, the PEMS shall calculate a pound per million BTU value at least once every 15 minutes, and all of the data produced in a calendar hour shall be averaged to produce a calendar hourly average value in pounds per million BTU. The 24 calendar hour averages in a given calendar day shall be averaged and used as the calendar daily average concentration in Appendix P.

The types of information needed for a PEMS are described below. The list of instruments and data sources shown below represent an ideal case. However at a minimum, each PEMS shall include continuous monitoring for at least items 3-5 below. MAP will identify and use existing instruments and refinery data sources to provide sufficient data for the development and implementation of the PEMs parametric software.

Basis Instrumentation:

1. Absolute Humidity reading (one instrument per refinery, if available)
2. Fuel Density, Composition and/or specific gravity - On line readings (it may be possible if the fuel gas does not vary widely, that a grab sample and analysis may be substituted)
3. Fuel flow rate
4. Firebox temperature
5. Stack excess oxygen reading
6. Airflow to the firebox (if known or possibly estimated)
7. Process variable data - steam flow rate, temperature and pressure - process stream flow rate, temperature & pressure, etc.

Computers & Software:

1. Windows NT computer or Honeywell Node - Windows NT is preferred so "PC Anywhere" software can be used to monitor the PEMs setup.
2. "Software CEM" to calculate the "predicted" NOx or CO emissions
3. Data management software to write the compliance monitoring reports

Calibration and Setup:

1. Data will be collected for a period of 3 to 7 days of all the data that is to be used to construct the mathematical model. The data will be collected over an operating range that represents 80% to 100% of typical heater/boiler operation
2. Collect data for "End of Run" and "Start of Run", if appropriate

3. A"Sensor Validation" analysis shall be conducted to make sure the system is collecting data properly

4. Stack Testing (by subcontractor) to develop the actual emissions data for comparison to the collected parameter data

5. Development of the mathematical models and installation of the model into the computer.

MAP is proposing to install these PEMS in the States of Louisiana, Kentucky, Illinois, Ohio, Minnesota and Michigan. If these States have enacted requirements that are directly applicable to these PEMS then the perfomance specifications shall be referenced as part of their installation and operation.

The heaters/boilers that are being considered for installation of PEMS are listed in the table below. The table shows the refinery and the specific heater/boiler and its' rated capacity. MAP has twenty six sources that are possible candidates for PEMS installation.

Table 1 - List of MAP Candidate Heaters/Boilers

	Capacity
Candidate Heaters/Boilers for PEMs	mmBTU/hr
CANTON REFINERY (1)	
Number 11 Boiler (4-16-B-11)	130
CATLETTSBURG REFINERY (9)	
FCC Charge Heater (2-1-B-8)	145
Number 3 Crude Charge Heater (2-23-B-3)	145
Number 3 Crude Charge Heater (2-23-B-4)	145
Number 4 Vaccum Heater (2-26-B-2)	145
Number 11 Boiler (1-39-B-1)	114

VGO Reactor Charge Heater (2-104-B-1)	103
VGO Reactor Charge Heater (2-104-B-2)	103
No. 2 Distillate Desulfurizer Stripper Reboiler (2-121-B-3)	100
DETROIT REFINERY (2)	
SR PLATFORMER CHARGE HEATERs	130
FCCU PREHEATER (11-H-1)	102
GARYVILLE REFINERY (4)	
Crude Vacuum Heater (10-1403)	138
Crude Vacuum Heater (10-1404)	138
Old Boiler # 1 (36-1601)	100
Old Boiler # 2 (36-1602)	100
ROBINSON REFINERY (7)	
HF Alky Isostripper Reboiler (7-F-1)	140
Crude Vacuum Heater (1-F-2)	130
Regular Coker Heater (90-F-1)	122
Ultraformer Reactor Preheater (3-F-3)	120
Ultrafiner Stripper Heater (2-F-2)	119
Ultraformer Reactor Preheater (3-F-4)	100
FCC Preheater (82-F-2)	100
ST PAUL REFINERY (3)	
#4 & #6 Boiler (Share a common Stack)	105
No. 1 Crude Charge Heater (5-1-B-7)	102
ALKYLATION & FCCU HEATER (5-8 & 28-B-1)	100
TEXAS CITY REFINERY (0)	
NONE	

The monitoring protocol for the PEMS to be installed on the heaters shall be based on EPA's "Alternative Monitoring Protocol" for an Industrial Furnace.

The elements of a protocol for a PEMS shall include:

1. Applicability

    a. Identify source name, location, and emission unit number(s)

    b. Identify the type of industry;

c. Identify the process of interest;

d. Identify the regulations that apply (e.g.; NSPS, NESHAP, SIP, and/or Consent Decree);

e. Identify the pollutant(s) subject to monitoring (information on major/area source determination).

f. Provide expected dates of monitor compliance demonstration testing

2. Source Description

a. Provide a simplified block flow diagram with parameter monitoring points and emission sampling points identified (e.g.; sampling ports in the stack);

b. Provide a discussion of process or equipment operations that are known to significantly affect emissions or monitoring procedures (e.g., batch operations, plant schedules, product changes).

3. Control Equipment Description

a. Provide a simplified block flow diagram with parameter monitoring points and emission sampling points identified (e.g.; sampling ports in the stack);

b. List monitored operating parameters and normal operating ranges;

c. Provide a discussion of operating procedures that are known to significantly affect emissions (e.g., catalytic bed replacement schedules, ESP rapping cycles, fabric filter cleaning cycles).

4. Monitoring System Design

a. Install, calibrate, operate, and maintain a continuous PEMS;

b. Provide a general description of the software and hardware components of the PEMS

including manufacturer, type of computer, name(s) of software product(s), monitoring technique (e.g., method of emission correlation). Manufacturer literature and other similar information shall also be submitted, as appropriate;

c. List all elements used in the PEMS to be measured (e.g., pollutant(s), other exhaust constituent(s) such as O_2 for correction purposes, process parameter(s), and/or emission control device parameter(s));

d. List all measurement or sampling locations (e.g., vent or stack location, process parameter measurement location, fuel sampling location, work stations);

e. Provide a simplified block flow diagram of the monitoring system overlaying process or control device diagram (could be included in Source Description and Control Equipment Description);

f. Provide a description of sensors and analytical devices (e.g., thermocouple for temperature, pressure diaphragm for flow rate);

g. Provide a description of the data acquisition and handling system operation including sample calculations (e.g., parameters to be recorded, frequency of measurement, data averaging time, reporting units, recording process);

h. Provide checklists, data sheets, and report format as necessary for compliance determination (e.g., forms for record keeping).

5. Support Testing and Data for Protocol Design

a. Provide a description of field and/or laboratory testing conducted in developing the correlation (e.g., measurement interference check, parameter/emission correlation test plan,

instrument range calibrations):

b. Provide graphs showing the correlation, and supporting data (e.g., correlation test results, predicted versus measured plots, sensitivity plots, computer modeling development data).

6. Initial Verification Test Procedures

a. Perform an initial relative accuracy test (RA test) to verify the performance of the PEMS over the permitted operating range. The PEMS must meet the relative accuracy requirement of the applicable Performance Specification in 40 CFR Part 60, Appendix B. The test shall utilize the test methods of 40 CFR Part 60, Appendix A.

b. Identify the most significant independently modifiable parameter affecting the emissions. Within the limits of safe unit operation, and typical of the anticipated range of operation, test the selected parameter for three RA test data sets at the low range, three at the normal operating range and three at the high operating range of that parameter, for a total of nine RA test data sets. Each RA test data set should be between 21 and 60 minutes in duration:

c. Maintain a log or sampling report for each required stack test listing the emission rate in accordance with the applicable emission limitations:

d. Demonstrate the ability of the PEMS to detect excessive sensor failure modes that would adversely affect PEMS emission determination. These failure modes include gross sensor failure or sensor drift.

e The owner or operator shall demonstrate the ability to detect sensor failures that would cause the PEMS emissions determination to drift significantly from the original PEMS value.

f. The owner or operator may use calculated sensor values based upon the mathematical

relationships established with the other sensors used in the PEMS. The owner or operator shall establish and demonstrate the number and combination of calculated sensor values which would cause PEMS emission determination to drift significantly from the original PEMS value.

7. Quality Assurance Plan

a. Provide a list of the input parameters to the PEMS (e.g., transducers, sensors, gas chromatograph, periodic laboratory analysis), and a description of the sensor validation procedure (e.g., manual or automatic check):

b. Provide a description of routine control checks to be performed during operating periods (e.g., preventive maintenance schedule, daily manual or automatic sensor drift determinations, periodic instrument calibrations)

c. Provide minimum data availability requirements and procedures for supplying missing data (including specifications for equipment outages for QA/QC checks):

d. List corrective action triggers [e.g., response time deterioration limit on pressure sensor, use of statistical process control (SPC) determinations of problems, sensor validation alarms]:

e. List trouble-shooting procedures and potential corrective actions:

f. Provide an inventory of replacement and repair supplies for the sensors:

g. Specify, for each input parameter to the PEMS, the drift criteria for excessive error (e.g.: the drift limit of each input sensor that would cause the PEMS to exceed relative accuracy requirements):

h. Conduct a quarterly electronic data accuracy assessment tests of the PEMS.

i. Conduct semiannual RA tests of the PEMS. Annual RA tests may be conducted if the most recent RA test result is less than or equal to 7.5%. Identify the most significant independently modifiable parameter affecting the emissions. Within the limits of safe unit operation and typical of the anticipated range of operation, test the selected parameter for three RA test data pairs at the low range, three at the normal operating range, and three at the high operating range of that parameter for a total of nine RA test data sets. Each RA test data set should be between 21 and 60 minutes in duration.

8. PEMS Tuning

a. Perform tuning of the PEMS provided that the fundamental mathematical relationships in the PEMS model are not changed.

b. Perform tuning of the PEMS in case of sensor recalibration or sensor replacement provided that the fundamental mathematical relationships in the PEMS model are not changed.